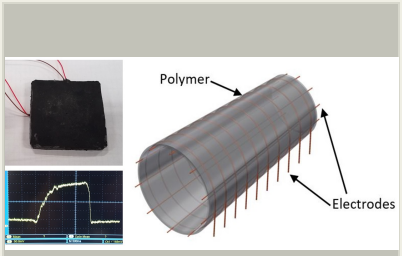
Flexible Polymer Sensor for Space Suits, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

Perception Robotics has developed an innovative new type of compliant tactile sensing solution, a polymeric skin (PolySkinTM) that can be molded into any form factor, supports a variety of mechanical properties, and is inherently inexpensive and durable. This novel tactile sensor surmounts the failures of prior tactile solutions with sophisticated multi-modal sensing capabilities, modeled after human hand sensing specifications, coupled with robust design for industrial and space applications. PolySkin is a perfect choice for measuring space suit interactions with the human body because it was designed for a similar problem: detect contact to allow robots to safely operate in an unstructured environment. PolySkin measures mechanical pressure accurately, has a good resistant to aberrant readings when under moderate bending, shear or torsion, is sufficiently pliant to follow anatomical curves on the human skin without discomfort or lack of mobility, it can be fabricated in thin profiles (~mm) and packaged sufficiently small, free of rigid or sharp points, and it consumes low power. During this project, we will fabricate a flat prototype of our novel tactile sensor and characterize and optimize the elastomer formulation to achieve desired properties: accuracy within 10%, dynamic range: 0.1 to 10N, and high repeatability (<5% error). We will build conditioning electronics to provide serial output signal through a USB port. After passing initial test, calibration, and validation, the conditioning electronics will be used to test in-sleeve embedded sensor. In a final proof-of-concept milestone, we will fabricate a working prototype wearable sleeve embedded with PolySkin to validate the performance. The deliverables include a 4x4 inch pad sensor at the end of 3rd month, and a wearable sleeve with embedded PolySkin sensor combined with conditioning electronics kit at the end of the project.



Flexible Polymer Sensor for Space Suits, Phase I Briefing Chart Image

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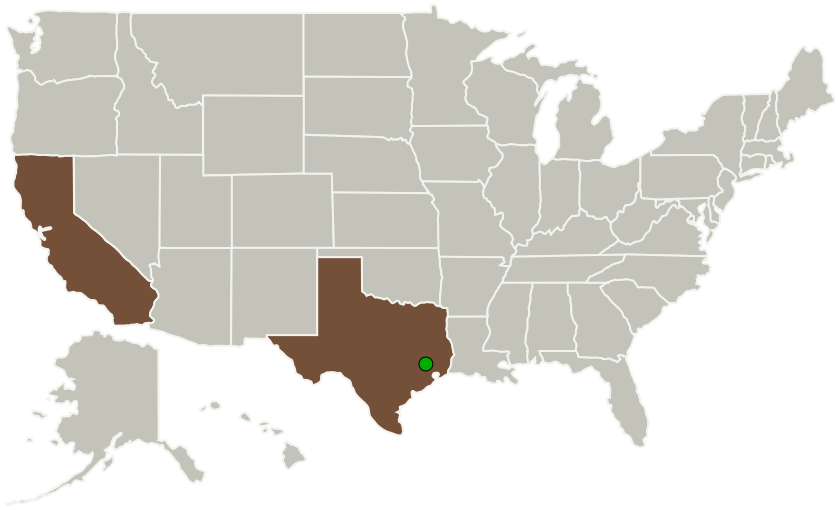
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Somatis Sensor Solutions	Lead Organization	Industry Historically Underutilized Business Zones (HUBZones)	Los Angeles, California
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
California	Texas

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Somatis Sensor Solutions

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

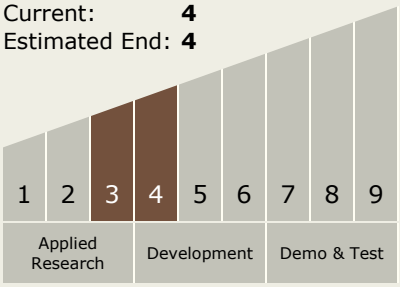
Carlos Torrez

Principal Investigator:

Nicholas Wettels

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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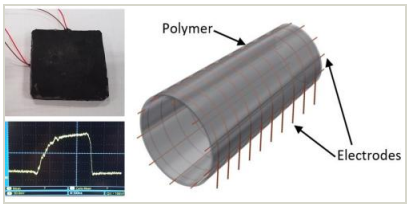
Images



Briefing Chart Image
Flexible Polymer Sensor for Space Suits, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/128273)*

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.3 Human Health and Performance
    - TX06.3.4 Contact-less / Wearable Human Health and Performance Monitoring

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System